

Part I

INTRODUCTION

Domestic *Preparedness*



A. PROGRAM GENERATION: NUNN-LUGAR-DOMENICI LEGISLATION

For more than two decades, prominent experts have been warning that terrorist groups could resort to the threat or use of chemical or biological weapons against civilian populations. While such weapons have been used in isolated, relatively minor instances in the past, the March 1995 Tokyo subway attack marked the first occasion of their successful use in a large-scale, indiscriminate assault on a major urban area. The likelihood of future use of these agents by terrorist groups or individuals is growing.

“As a result of the subway attack, significant threats over the past few years, and the increased availability and proliferation of nuclear, biological, and chemical (NBC) materials, there is an increasing concern for the potential of terrorist incidents occurring in the United States.” This was the finding of the Congressional report entitled *“Report on Government Capabilities to Respond to Terrorist Incidents Involving Weapons of Mass Destruction – Message from the President of the United States.”* Congress views NBC terrorism as an increasing threat that will continue for years to come. As a result, Congress passed legislation under Title XIV Defense Against Weapons of Mass Destruction referred to as the Nunn-Lugar-Domenici (NLD) Domestic Preparedness Program (DPP). This legislation authorized and allocated necessary funding and appointed the Department of Defense (DoD) the executive agent for coordination of assistance from Federal agencies through the States to enhance first responder preparedness.

The NLD legislation called for the following:

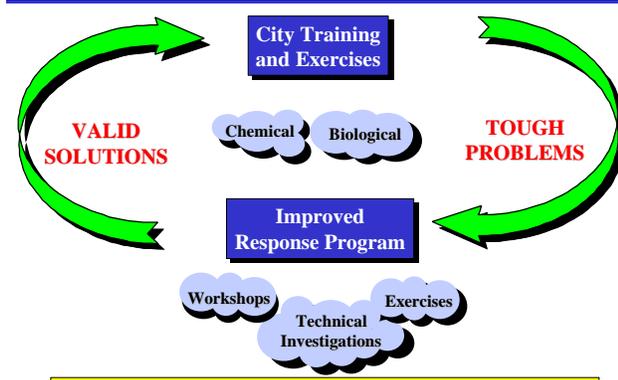
- The establishment of a training and exercise program that targets selected cities.
- A national hotline/helpline program designed to receive and process inquiries from the responder community.
- A program designed to identify systematic deficiencies in response capabilities of the community as a whole.

The Chemical Weapons Improved Response Program (CWIRP) was established to address the latter of these objectives.

The U.S. Army Soldier and Biological Chemical Command (SBCCOM), the center of DoD’s chemical and biological expertise, is the lead agency charged with executing the NLD DPP. SBCCOM has in turn partnered with numerous Federal, State, and local government organizations and members of the academic and business communities to execute this program.

The CWIRP is designed as a comprehensive evaluation entity that first will identify shortfalls and information gaps and then evaluate alternative concepts, procedures, and equipment that will address those gaps and shortfalls.

Improved Response Process



B. PARTNERSHIP APPROACH

SBCCOM has over the past year worked in partnership with numerous agencies and organizations under the auspices of the Improved Response Program to find new innovative approaches to this challenge. The list includes the following:

- Federal Bureau of Investigation (FBI), Washington and Baltimore Offices
- Federal Emergency Management Agency (FEMA)
- U.S. Public Health Service (USPHS)
- U.S. Environmental Protection Agency (EPA)
- U.S. Department of Energy (DOE)
- U.S. Army Aberdeen Proving Ground Fire Department
- U.S. Army Medical Research Institute of Chemical Defense
- Maryland State Police
- Maryland Emergency Management Agency (MEMA)
- Maryland National Guard
- Baltimore City Office of Emergency Management (OEM)
- Baltimore City Fire Department
- Baltimore City Mass Transit Authority Police
- Baltimore City Police Department
- Baltimore City Health Department
- Baltimore County Fire Department
- Baltimore County Police Department
- Baltimore County Office of Emergency Management
- Carroll County Office of Emergency Management
- Carroll County Fire Department
- Howard County Fire and Rescue Services
- Montgomery County of Fire and Rescue Service

This program has been successful thus far solely because of the contributions of these agencies listed above. We look forward to continuing this productive working relationship.

Part II

MAJOR ACTIVITIES SUMMARY



A. CHEMICAL WEAPONS IMPROVED RESPONSE PROGRAM WORKSHOP

Date: July 8 to 10, 1997

Location: Battelle Corporation, Bel Air, MD

1. Introduction. The CWIRP's first meeting was an organizational effort designed to establish goals and objectives, organizational infrastructure, and roles and responsibilities. The forum brought together representatives from the Federal, State, and city (primarily Baltimore and New York cities) local governments and the emergency responder and management communities to solicit ideas and approaches to satisfy the intent of the DPP legislation. The legislation established the following long-range, systematic goals:

- To identify capability shortfalls and fill gaps in current knowledge, concepts, procedures, and equipment needed to enhance further domestic preparedness.
- To develop and demonstrate an improved integrated model system to combat terrorism at Federal, State, and local levels that could be offered throughout the nation.
- To support the continuous integration of program results through training.

2. Background. The objectives of the workshop were as follows:

- To identify and assemble the appropriate participants to discuss and establish program objectives, plan its execution, and define roles.
- To provide to the city and State responders an understanding of the capabilities of SBCCOM with respect to defense against the employment of chemical and biological weapons.
- To provide the responders the knowledge of how chemical and biological weapons can be used in an urban terrorist setting.
- To observe and discuss the level of preparedness against terrorism acquisition of motivation, knowledge, and capability.

The 3-day conference consisted of information briefings presented by (1) SBCCOM on agent characteristics and history of employment, (2) Baltimore City officials on emergency response infrastructure and responsibilities, and (3) several State and Federal government representatives on capabilities and missions of their respective agencies and departments.

The key accomplishment of the workshop was the establishment of four functional working groups chaired by individuals from the local response and emergency management community. These groups would be the primary vehicles through which the program would be executed. The groups were designated as follows:

- Law Enforcement – Chairman Special Agent Jim Barry, FBI Baltimore Office
- Health and Safety – Chairwoman Mrs. Irene Lumpkins, Baltimore City Health Department
- Emergency Management – Chairman Mr. Richard Muth, Baltimore County Fire Department
- Emergency Response – Chairman Deputy Chief Ted Jarboe, Montgomery County Fire and Rescue Service

The consensus was that the general forum should be conducted at least once a quarter while individual functional group meetings would be conducted as required between quarterly meetings.

B. BALTIMORE EXERCISE (BALTEX) I

Conducted: September 9 to 10, 1997

Location: Aberdeen Proving Ground (Edgewood Area), MD

1. Introduction. BALTEX I was hosted by SBCCOM. BALTEX I was the second meeting of the Chemical Weapons Improved Response Program.

2. Background. BALTEX I demonstrated the knowledge and capabilities required for constructing terrorist-style chemical agent weapons/devices and the immediate effects of their dissemination. The chemical devices ranged from crude homemade ones to sophisticated, professionally developed weapons. The primary emphasis of the exercise was on the physics and engineering requirements of chemical terrorism.

The following objectives were accomplished:

- Demonstration of the levels of technical understanding required to construct selected devices.
- Display of types of equipment/facilities required for producing a device.
- Demonstration of the physical design characteristics of a range of chemical devices.
- Demonstration of the effects of device detonation/activation.
- Participant familiarization and orientation to exercise functional working groups.



Participants included members of the first responder communities of the Baltimore metropolitan region as well as State and Federal representatives. The 2-day exercise included briefings to inform participants of the structure and purpose of the DPP, live fire demonstrations in field locations, and facilitated indepth brainstorming sessions focused on a scenario depicting terrorist employment of a nerve agent weapon in an urban setting.

C. BALTEX II

Conducted: November 18 to 19, 1997

Location: Aberdeen Proving Ground (Edgewood Area), MD

1. Introduction. BALTEX II was a tabletop exercise conducted as part of the Chemical Weapons Improved Response Program. It provided the opportunity for first responders of the Baltimore region and other representatives of related emergency management agencies and organizations (local, State, Federal, and institutional) to identify key problems associated with consequence management and mitigation of the employment of a terrorist chemical device.

2. Background. Objectives of the exercise were the following:

- Create a 'problems baseline' citing key issues or shortcomings associated with current knowledge and skills.
- Collect and prioritize all problems.
- Merge and prioritize problem lists with those of other first responder community organizations and institutions.
- Define and attack an approach to resolve highest priority problems.

BALTEX II provided the platform from which key issues were defined. The tabletop scenario depicted a small device (briefcase) containing a non-persistent nerve agent placed in the Baltimore Museum of Art and causing a small number of casualties (3 dead; 7 hospitalized). Situation manuals containing background information, situation updates, maps, and other supplemental materials were given to all attendees. Additionally, audiovisual aids and an oral presentation by a briefer established the setting and paced the exercise. The scenario was broken down into four modules:

- Module 1 – Warning
- Module 2 – Initial Response
- Module 3 – Follow-On Response
- Module 4 – Long-Term Response/Recovery

A facilitated discussion session followed each module and focused on problem identification. Discussion groups were organized along functional lines: health and safety, emergency management, law enforcement, and first responder. Functional work group chairpersons were in charge of each work group session. Each functional work group developed its own problem list.



Work group discussions prioritized the identified problems in these followup work group discussions that continued during Day 2 of the exercise.

D. BALTEX III

Conducted: February 24 to 25, 1998

Location: Rowing Club, Baltimore, MD

1. Introduction. BALTEX III was a time-phased, tabletop exercise designed to facilitate close examination and analysis of first responder activities in the first hour of a weapon(s) of mass destruction (WMD) event.

2. Background. BALTEX III was divided into five phases of activities as follows:

- Warning
- Initial Response (first 20 minutes)
- Initial Response (second 20 minutes)
- Initial Response (third 20 minutes)
- Follow-On Response/Recovery

The majority of the exercise was spent on the Initial Response phases with only a brief review of the Warning and Follow-On phases. A lead facilitator conducted the situation briefing while supporting facilitators were assigned to each one of the functional working groups to support the group chairpersons. As in previous BALTEXs, the plenary groups were the emergency management, emergency response, health and safety, and law enforcement functional groups. Discussions of actions, consequences, and solutions developed in and around the scenario took place in each of the functional groups.



Mr. Ron Hill, State of Oklahoma Emergency Management Agency, began the second day of BALTEX III with a presentation describing the key emergency management lessons learned from the Oklahoma City bombing in 1995. BALTEX participants were primarily concerned with the activities surrounding coordination and mutual supporting efforts among Federal, State, and local responders and emergency management personnel. Mr. Hill's presentation was very informative for the BALTEX process it highlighted key problem areas which need to be addressed in the command and control arena that will have an impact on response improvement efforts.

The SBCCOM update presented insight to the technical efforts in the personal protection, detection, and mass decontamination programs. SBCCOM personnel presented program schedules, objections, accomplishments to date, and other study information. Finally, Lieutenant Colonel Don Harrington discussed efforts on the part of the National Guard and Army Reserves to complement the DPP.



E. BALTEX IV

Conducted: June 2 to 3, 1998

Location: Gateway Building, Howard County, MD

1. Introduction. BALTEX IV was a time-phased, tabletop exercise designed to facilitate close examination and analysis of first responder and emergency management activities in the first day of a WMD event.

2. Background. BALTEX IV was divided into four modules as follows:

- Introduction and Recap of BALTEX III
- Follow-On Response Phase – 1 (H+1 to H+3)
- Follow-On Response Phase – 2 (H+4 to H+12)
- Follow-On Response Phase – 3 (H+13 to H+24)

A lead facilitator conducted the situation briefing while supporting facilitators were assigned to each one of the functional working groups to support the group chairpersons. As in previous BALTEXs, the plenary groups were the emergency management, emergency response, health and safety, and law enforcement functional groups. Discussion of actions, consequences, and solutions took place in each of the functional groups.

BALTEX IV focused on the Follow-On Response phase and began with a brief review of BALTEX III which included a Warning phase and three Initial Response phases of 20 minutes each. The result was a detailed analysis of the ‘golden hour’ of the WMD event presented in the scenario. The BALTEX IV scenario picked up at the end of the first hour and depicted events through to the end of the first day.

The second day of BALTEX IV began with a presentation from Dr. Henry W. Fischer III from the Millersville University’s Sociology Department. Dr. Fischer discussed anticipated behavioral response on the part of the general public to an incident involving WMD as well as the responder community’s perceptions and misconceptions of those behaviors. BALTEX participants were actively engaged in the presentation and were primarily concerned with the lessons learned by the study of past natural and technological disasters and the public’s response to those incidents. Dr. Fischer’s



presentation was well received and informative, for the BALTEX process it highlighted areas of concern that may not normally be addressed by first responders.

The SBCCOM update presented additional insight into the ongoing technical efforts in the personal protection, detection, and mass decontamination programs. SBCCOM personnel presented program schedules, objections, accomplishments to date, and other study information.



F. BALTEX V

Conducted: September 9 to 10, 1998

Location: Baltimore City Fire Academy, Baltimore, MD

1. Introduction. BALTEX V was an emergency response demonstration exercise focusing on the first hour of response to a WMD event. The functional exercise was followed by a day of presentations focusing on key issues and challenges that have been identified by representatives from the government, business, and emergency responder and management communities who make up the BALTEX functional groups.

2. Background. BALTEX V began with an enactment of the scenario that was developed in BALTEX III. This scenario involved the release of a chemical agent (mustard/lewisite mix) at the Round House Theater in Wheaton, MD, where residents of a nearby nursing home were viewing a play.

The objective of the demonstrations was to exercise innovative mitigation techniques using role players as victims, and emergency response personnel and equipment from county and city responders who support the BALTEX program. Over 150 players and observers were present which included five city and county fire and police departments (specifically, Baltimore, Montgomery and Howard Counties, Baltimore City, and Washington, DC). Some of the techniques explored included:



- Use of personal protective equipment (PPE) quick-fixes developed by SBCCOM as added protection for firefighters wearing bunker gear.
- Use of chemical agent detectors by first responders and hazardous material (HazMat) crews.
- Demonstration of several field expedient mass decontamination procedures and techniques.
- Use of positive pressure ventilation systems to reduce the agent concentration within the affected building.
- Evidence collection (e.g., clothing, and personal effects) techniques in a chemical environment by law enforcement personnel.



BALTEX V participants and observers were given the opportunity to analyze and critique the exercise during the demonstration and at an after-action review.

The second day of BALTEX V featured presentations by key representatives of the BALTEX process. These presenters included:

- Mrs. Irene Lumpkins of the Baltimore City Health Department and the Chairperson of the Health and Safety Functional Group presented an overview of the group's activities. She discussed the group's mission and Baltimore City Health Department response plans to a WMD incident. She also gave an overview of several key public health challenges that will be addressed by her group in the near future.
- Special Agent Jim Barry from the FBI Baltimore office and Chairperson of the law enforcement functional group presented an overview on the FBI's approach to chemical and biological terrorism and the FBI's intelligence collection and dissemination procedures for notifying agencies of a potential threat.
- Mr. Warren Carroll from the Battelle Memorial Institute discussed the mass decontamination study effort of the Mass Casualty Decontamination Research Team. The focus of this effort is on the best procedures for decontamination in a civilian setting and integration of decontamination prioritization procedures with standard casualty triage procedures.



The afternoon of Day 2 included briefings by members of SBCCOM. Mr. Al Goodman briefed on chemical and biological agent properties and characteristics. Mr. Paul Schabdach presented a demonstration of chemical/biological agent dissemination devices.

Part III

FUNCTIONAL WORKING GROUPS



A. LAW ENFORCEMENT FUNCTIONAL GROUP

Chairperson: Special Agent Jim Barry, FBI Baltimore Office

1. Mission. The law enforcement group identifies and proposes recommendations to issues challenging the effective implementation of law enforcement activities prior to, at the scene of, and immediately following the use of chemical WMD. One of the key areas of interest is the working relationship and coordination among the various law enforcement agencies and departments from the local to the Federal level of government. Additionally, this group focuses on the PPE and training needs of law enforcement personnel.



2. Background. Special Agent Barry is supported by representatives from the law enforcement community throughout the Baltimore-Washington metropolitan area as well as New York City. Regular attendees to the group meetings include those from Baltimore City; Baltimore County; Washington, DC; and New York City Police Departments, officers from various surrounding counties of Baltimore, and the Maryland State Police.

3. Priority Issues. The group has identified the following areas of interest as needing special attention:

- Specialized PPE for the various functional specialties (e.g., special weapons and tactics, security, bomb squad, etc.) within law enforcement.
- The serious lack of WMD awareness, training, and equipment among those within the law enforcement community as a whole.
- Evidence collection and management procedures in a chemical incident. This includes protocols on where and how to send evidence for analysis.
- Protocols and guidelines for the dissemination of intelligence information among responder and emergency management organizations prior to the onset of an incident.
- The identification of shortcomings within the communications infrastructure among law enforcement command posts and control centers.

B. EMERGENCY MANAGEMENT FUNCTIONAL GROUP

Chairperson: Richard Muth, Baltimore County Fire Department

1. Mission. The emergency management group addresses issues directly related to coordination, resource support, and contingency planning and logistical support to outside response organizations.

2. Background. Mr. Muth, an emergency management official for Baltimore County, is the group chairperson. Permanent members included the Baltimore City Emergency Manager, representatives from MEMA, and the Howard County emergency management office. The Pentagon's Department of Military Support and Red Cross representatives frequently support the group as required.



3. Issue Priorities. The group has identified the following issues as major areas of concern associated with a terrorist WMD event:

- The need for threat intelligence information sharing among selected emergency response and management organizations and individuals before the occurrence of an event.
- Efficient and effective implementation of a Unified Command System (UCS) to maximize the efforts of response organizations.
- Development and implementation of direction and control procedures and equipment for response units from various organizations within a jurisdiction and supporting units from surrounding mutual-aid jurisdictions as well as State and Federal response units.
- Development of a concept or plan for prioritization of resource requirements and allocation procedures.
- Development of procedures to make the media an ally in the dissemination of information while reducing the potential negative impact of the media.
- The need to develop a system for long-term monitoring of incident victims who have been contaminated and survived.
- Close examination and scrutiny of the impact of WMD events on the special needs community (e.g., wheelchair bound, hearing and visually impaired, etc.).

- How clean is clean? This is especially important when planning restoration activities for areas of a community that have been affected by, for example, a persistent chemical agent.
- The adequacy of the critical incident stress system assets; will it be enough for this type of an event, especially a large-scale event, that involves thousands of victims?

C. EMERGENCY RESPONSE FUNCTIONAL GROUP

**Chairperson: Ted Jarboe, Montgomery County
Fire and Rescue Service**

1. Mission. The emergency response group addresses the concerns of responders who arrive first on the scene. The group identifies and proposes solutions to the unique challenges posed by a WMD during the first minutes and hours of an incident. Their ultimate goal is to make these types of operations more efficient, effective, and safe.

2. Background. Chief Jarboe's group consists of a well-rounded group of experienced first responders from the firefighting and HazMat profession. Regular attendees of the group include Thomas Herlihy of the Washington, DC Fire Department; Joe Dillon of the Baltimore City Fire Department; and Garry Warren of the Baltimore County Fire Department. One of the key group concerns is the extent of protection afforded by standard bunker gear.



3. Issue Priorities. The group's top priority issues or shortfalls to first responder actions in a WMD incident are as follows:

- Intelligence/information sharing among the firefighting, HazMat, and law enforcement communities before an incident occurs.
- Training of dispatch personnel on clues that lead to early recognition of incidents of terrorism and the communication of that information to the responding units.
- Responder individual protection and survival on the scene. More information is needed about the extent of protection provided by bunker gear.
- Crowd control and management issues that are complicated by WMD terrorist incidents.
- Detection and identification of agents for not only HazMat units but firefighting units as well.
- Mass decontamination operations for responders but particularly for the civilian population on the scene and in the surrounding vicinity.
- Identification of regional, State, and Federal resources including those of the Chemical Stockpile Emergency Preparedness Program (CSEPP) and the Technical Escort Unit (TEU).

D. HEALTH AND SAFETY FUNCTIONAL GROUP

Chairperson: Mrs. Irene Lumpkins, Baltimore City Health Department

1. Mission. The Health and Safety Functional Group focuses its attention on issues that impact the well being of the community at large and the challenges associated with maximizing the impact of local and regional public health and medical resources.

2. Background. Permanent members of this group are from the Baltimore City Health Department, the Maryland Institute of Emergency Medical Services System (MIEMSS); and it also has a representative of the SBCCOM. State public health officials, the Federal Public Health Service, and surrounding major hospital and county public health representatives also support as issues requiring their input and support arise and are addressed. The Baltimore metropolitan region has a unique concentration of highly advanced cutting-edge medical institutions from which expertise can be drawn. This should make this group an outstanding forum from which new and innovative approaches can be developed and disseminated.

3. Issue Priorities. The following shortfalls and systemic challenges have been identified as the areas that require the most immediate attention:

- Communication and coordination among all medical resources: local, regional, and State.
- Information flow/exchange from the law enforcement and emergency management community into the health and safety community.
- Formalized coordinated resource identification and distribution system among medical institutions and facilities to get chemical and biological unique equipment and pharmaceuticals to the right place at the right time.
- Coordination of public and private medical institutions and supporting organizations in the affected region.
- Updating of standard/emergency operating procedures among all medical emergency response and management agencies.

Part IV

TECHNICAL STUDY INITIATIVES



A. PERSONAL PROTECTIVE EQUIPMENT

1. Study Objectives. The primary objective of the firefighter protective clothing assessment (bunker gear testing) is to evaluate the degree of protection against chemical warfare agents afforded by standard firefighter protective gear during a quick rescue. Testing was conducted with firefighters wearing self-contained breathing apparatus (SCBA) for eye and respiratory protection and bunker gear for skin protection.

2. Study Overview. Man-In-Simulant Tests (MIST) vapor tests measure the actual adsorption of agent simulant (methyl salicylate, [MeS] basically wintergreen oil) into human skin by using passive samplers located on 23 skin regions of the body. The samplers are applied directly to the firefighter's skin. The test subjects dress in standard bunker gear with SCBA. They are then directed to enter a chamber filled with MeS vapor simulant while performing firefighter activities for 30 minutes. Finally, the amount of simulant that is adsorbed into the skin samplers is measured.



MIST vapor tests were conducted at the Edgewood Chemical Biological Center (ECBC) in January and February 1998 using Montgomery County firefighter bunker gear. Verification MIST vapor tests were conducted at the Royal Military College (RMC) in Ontario, Canada, during April and May 1998. RMC served as an independent test facility to validate the vapor tests at ECBC. Quick-fix testing was also conducted at ECBC to assess improved protection that was offered by bunker gear using on-site modifications to the bunker gear that could be quickly applied using materials available to virtually all firefighters. These quick-fix tests included duct taping the wrist, ankle, and waist closures (conducted in March 1998) and outfitting the firefighter with two plastic trash bags in a raincoat type configuration underneath the bunker gear with all closures taped (conducted in June and July 1998). Also Tyvek F suits were tested underneath the gear in July 1998.

Aerosol deposition MIST testing was also conducted at Research Triangle Institute (RTI), Research Triangle Park, NC. This testing measured the actual deposition of aerosol on the skin. These tests were conducted at RTI starting in March and ending in May 1998. In August, unprotected tests (shorts and SCBA only) were conducted which allow protection factors (PF) to be calculated for aerosol tests.



In July 1998, an Incident Command Research Team was established jointly with the firefighter community and SBCCOM to ensure standard firefighter operations and procedures are included in the final report. Additionally, this team was established to ensure that data is presented in formats and charts that are operationally useful to the Incident Commander (IC) and firefighters. This 'firefighter version' of the PPE IC report is based on the technical hazard assessment of the test data and is undergoing a thorough review by both the firefighter and technical communities.

B. POSITIVE PRESSURE VENTILATION

1. Study Objectives. The purpose of this study is to conduct a series of tests for measuring the hazard reduction firefighters or emergency medical personnel can achieve by rapidly employing expedient measures while entering a building in which a terrorist release of chemical agent is known or suspected to have occurred. This testing was conducted to examine near-term measures with which to protect first responders while minimizing the impact upon the rescue mission.

2. Study Overview. Positive pressure ventilation (PPV) fans have been employed in fighting structural fires for about a decade. These fans are carried on fire trucks of most fire departments and are used to purge a building of smoke, carbon monoxide, and hot gases. This testing will complement the bunker gear testing by employing PPV fans in a simulated chemical terrorist incident to quickly reduce the concentration of an agent in a building before fire and rescue personnel enter for rescue operations. Rescue personnel would wear SCBA for eye-respiratory protection and bunker gear for skin protection. Reducing the vapor concentrations in the building during the rescue operation (approximate duration 5 minutes) would reduce the skin hazard to rescue personnel wearing bunker gear, or possibly increase the permitted duration of the rescue operation for these quick rescue scenarios. Phase I of the PPV testing was conducted in August and September 1998 and with Phase II testing was conducted during October and November 1998.



Like the application of PPV for fire fighting, use of PPV for vapor suppression and purging is also subject to limitations. In theory, using PPV can force the agent to spread to other zones of a building (i.e., when the agent has been released in the lobby of a multi-story building and occupants have not been evacuated from upper floors). In such cases, negative pressure ventilation would be preferable, although the PPV fans is said to be less efficient in the depressurization mode than in the pressurization mode. Also, driving an agent out of a building, whether by positive or negative pressure ventilation, can create a hazard to people downwind of the building. The primary objective of this study, therefore, is to define parameters and conditions for the safest, most effective employment of PPV.

With regard to suppression, this study examined three methods readily available to emergency personnel for reducing the rate of evaporation of an agent once its source is determined—applying HAZMAT absorbent, firefighting foam, and plastic tarp or cover.

The vapor suppression portion was conducted with MeS to examine, under controlled conditions, the effect of each type of suppressive treatment. Testing was divided into two phases as follows:

Phase I. This phase was conducted in August and September 1998, without the firefighters' active participation as test subjects in order to determine the effects of the expedient measures in terms of concentration reduction. Purging test techniques differ from suppression tests as follows:

Purging. Using the tracer gas sulfur hexa-fluoride, the concentrations were measured over time both with and without the use of the fans to determine the building's rate of air exchange with the outside environment. The following types and configurations of PPV fans were used during Phase I to determine the air exchange rate:

- Single 21-inch (diameter)
- 30-inch gas fans
- Two 21-inch gas fans in series
- Single 24-inch electric
- Two stacked 16-inch electric fans

Experiments were run with one building configuration and similar conditions of temperature and ambient wind velocity to minimize the effect of weather upon the air exchange rate.

Vapor Suppression. Using the simulant MeS concentrations evaporating from a simulant pool of fixed size was measured over time within a 4-foot by 4-foot by 7-foot glass booth with controlled temperature and ventilation rate. Vapor concentrations were measured with and without each of the three treatments: cover, absorbent, and foam to determine the best vapor suppressant.

Phase II. Six operational tests were conducted with MeS, each with four test participants from the Montgomery County Fire Department. One test was conducted without using PPV fans as a baseline. The remaining tests were performed using the 21-inch gas fan and the two 16-inch stacked electric fans. These fan configurations were selected because they represent the fans most commonly used during firefighting. In each, four firemen entered the building once a relatively stable concentration of MeS was produced in the building. They employed the fans in the most effective mode, as determined in Phase I and performed a simulated rescue operation using six staged dummies. Sampling patches were placed on the skin of each firefighter to measure the dosage to the skin following the procedures of the MIST testing currently in use at the ECBC MIST facility. The total time for the simulated rescue mission was held constant at 30 minutes in order to compare the data with that of the current MIST data (although it is recognized that firefighters will limit their rescue mission to about 2 to 5 minutes). Phase II tests were conducted during October and November 1998.

Currently the test report is being prepared to address the following issues:

- What reduction in concentration and dosage of agent vapor can be expected by using positive pressure ventilation during entry?
- What effect does negative- as opposed to positive-pressure ventilation have on the spread of an agent to other zones of the building?
- Does negative-pressure ventilation provide hazard reduction equal to positive-pressure ventilation?
- What guidance can be provided the first responders on how the effectiveness of the ventilation varies with the following parameters:
 - Fan flow rate
 - Quantity of fans
 - Distance to the source
 - Distance of fans to the entry opening
 - Size of exit opening
 - Building configuration
 - Building spatial volume
 - Ambient wind direction

What reduction in concentration and dosage can be expected by covering the agent source with each of the following vapor-suppression treatments: a tarp, HazMat absorbent, and foam?

C. MASS DECONTAMINATION

1. Study Objectives. The mission of the mass decontamination study is to identify and propose solutions to the challenge of effectively and efficiently decontaminating victims, both responder and civilian, of a chemical event. The following are the key objectives of the study:

- To establish valid reasons for and efficacy of mass decontamination for ambulatory, non-ambulatory, and deceased casualties based on human physiology. Consideration must be given to the effects of time for exposure and potential residual concentration levels.
- To identify current foreign and domestic, military and civilian, water-based and non-water-based mass casualty decontamination methods and contamination control techniques, including logistics trails and commonality with current procedures used by civilian response teams.
- To demonstrate, through one or more staged limited-scale exercises, that currently available equipment can be used by emergency responders to perform expedient, water-based decontamination of mass chemical agent casualties.
- To develop a list of technologies, equipment, and procedures that show the most promise for meeting mass casualty decontamination needs. Recommend development efforts and potential funding sources.

2. Study Overview. One of the critical tasks to accomplish this in response to an incident involving the use of a chemical agent will be the decontamination of personnel and equipment. It is essential to saving lives and preventing the spread of contamination outside of the incident site. With the exception of those individuals experiencing agent symptoms, it will be extremely difficult to determine who has been in contact with the agent. The fact is, persons may have agent on their clothes that has not penetrated to the skin or is not rapidly vaporizing. Many agents may cause delayed symptoms. This leads to the belief that everyone at the incident site will need to undergo decontamination. Depending on the method of dispersal and the target of the attack, anywhere from a few to several thousand people could require decontamination.

The study will proceed in the following steps:

- Organize, plan, and execute a thorough research effort to review and evaluate current foreign and domestic mass decontamination technologies, procedures, and equipment. In order to optimize the validity and credibility of the final recommendations, ensure review and input by a government/contractor/local responder team throughout the research effort.
- Perform small-scale procedural experiments at a beta site to develop candidate, water-based mass decontamination procedures using existing first responder equipment.

Present results to participants in BALTEX exercises and/or at quarterly Government reviews.

- Deliver the following three coordinated technical reports:
 - Comprehensive Final Report – A technical report on the consensus recommendation(s) of how best to meet the study’s technical objectives. Include all supporting data, any dissenting opinions, and alternative options.
 - Abbreviated Final Report – Condensed version of the comprehensive technical report including the essential recommendations and supporting logic/data.
 - Training Literature – Supporting data used to update the syllabus and training lessons used for the 120-city domestic preparedness course.



Part V

PROGRAM POINTS OF CONTACT



DOMESTIC PREPAREDNESS PROGRAM POINTS OF CONTACT

Domestic Preparedness Program Hotline..... (800) 368-6498

**Chemical Program DirectorMr. Randy Laye
(410) 436-7446**

**Chemical Team LeaderMr. Bill Lake
(410) 436-4008**